

## CLAIMS

What is claimed is:

- 1 1. A method comprising:  
2 depositing a no-flow underfill material in a component mounting area of a  
3 substrate, the component mounting area comprising a plurality of pads;  
4 placing a component on the component mounting area, such that terminals of  
5 the component are aligned with corresponding pads and substantially enveloped in  
6 the underfill material;  
7 applying suitable pressure to cause the terminals to physically contact the  
8 pads; and  
9 applying suitable heat to harden the underfill material.
- 1 2. The method recited in claim 1, wherein, in depositing, the underfill material  
2 is deposited over the pads.
- 1 3. The method recited in claim 1, wherein, in depositing, the underfill material  
2 comprises a filler material to reduce the coefficient of thermal expansion.
- 1 4. The method recited in claim 1, wherein, in depositing, the underfill material  
2 comprises a filler material to increase the modulus of elasticity.
- 1 5. The method recited in claim 1, wherein, in depositing, the underfill material  
2 comprises a filler material to increase the viscosity.
- 1 6. The method recited in claim 1, wherein, in depositing, the underfill material  
2 comprises a filler material selected from the group comprising silica, silicon oxide,  
3 silicon dioxide, silicon nitride, aluminum oxide, and aluminum nitride.

1 7. The method recited in claim 6, wherein, in depositing, the filler material is in  
2 the range of 0% to 80%, by weight, of the underfill material.

1 8. The method recited in claim 1, wherein, in depositing, the underfill material  
2 comprises filler particles having a size in the range of 0.05 microns to 40 microns.

1 9. The method recited in claim 8, wherein, in depositing, the filler particles are  
2 substantially spherical.

1 10. The method recited in claim 1, wherein, in depositing, the underfill material  
2 comprises a resin selected from the group comprising an epoxy resin, a siloxirane  
3 resin, a superoxirane resin, a polybenzoxazine resin, a benzocyclobutane resin, or a  
4 mixture thereof.

1 11. The method recited in claim 1, wherein, in depositing, the underfill material  
2 comprises a fluxing agent.

1 12. The method recited in claim 11, wherein, in depositing, the fluxing agent is  
2 selected from the group comprising an organic carboxylic acid, a polymeric fluxing  
3 agent that has one or more carboxylic acid groups, an organic compound that  
4 contains one or more hydroxyl groups, or a mixture thereof.

1 13. The method recited in claim 1, wherein the pads are pre-coated with solder,  
2 and wherein, in applying suitable heat, the terminals become attached to the pads  
3 through the solder.

1 14. The method recited in claim 1, wherein the terminals are pre-coated with  
2 solder, and wherein, in applying suitable heat, the terminals become attached to the  
3 pads through the solder.

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- 1 15. The method recited in claim 1, wherein the terminals and the pads are pre-  
2 coated with solder, and wherein, in applying suitable heat, the terminals become  
3 attached to the pads through the solder.
- 1 16. The method recited in claim 1, wherein the operations of applying suitable  
2 pressure and suitable heat are performed substantially concurrently.
- 1 17. The method recited in claim 16, wherein the operations of applying suitable  
2 pressure and suitable heat are performed by apparatus from the group comprising a  
3 thermocompression bonder and an ultrasonic bonder.
- 1 18. The method recited in claim 1, wherein the operation of applying suitable  
2 pressure is performed by a die placement tool.
- 1 19. The method recited in claim 18, wherein the pads are pre-coated with solder,  
2 and wherein the method further comprises:  
3 pre-attaching the terminals to the pads by applying suitable heat using the  
4 die placement tool.
- 1 20. The method recited in claim 18, wherein the terminals are pre-coated with  
2 solder, and wherein the method further comprises:  
3 pre-attaching the terminals to the pads by applying suitable heat using the  
4 die placement tool.
- 1 21. The method recited in claim 18, wherein the operation of applying suitable  
2 heat is performed by solder reflow apparatus.
- 1 22. A component package fabricated by:  
2 depositing a no-flow underfill material in a component mounting area of a  
3 substrate, the component mounting area comprising a plurality of pads;

4 placing a component on the component mounting area, such that terminals of  
5 the component are aligned with corresponding pads and substantially enveloped in  
6 the underfill material;

7 applying suitable pressure to cause the terminals to physically contact the  
8 pads; and

9 applying suitable heat to harden the underfill material.

1 23. The component package recited in claim 22 and fabricated such that the  
2 operations of applying suitable pressure and suitable heat are performed  
3 substantially concurrently by apparatus from the group comprising a  
4 thermocompression bonder, an ultrasonic bonder, and a component placement tool.

1 24. The component package recited in claim 22 and fabricated such that the pads  
2 are pre-coated with solder, and wherein, in applying suitable heat, the terminals  
3 become attached to the pads through the solder.

1 25. The component package recited in claim 22 and fabricated such that the  
2 terminals are pre-coated with solder, and wherein, in applying suitable heat, the  
3 terminals become attached to the pads through the solder.

1 26. The component package recited in claim 22, wherein the underfill material  
2 comprises a filler material selected from the group comprising silica, silicon oxide,  
3 silicon dioxide, silicon nitride, aluminum oxide, and aluminum nitride.

1 27. An electronic assembly comprising at least one integrated circuit (IC)  
2 package fabricated by:  
3 depositing a no-flow underfill material in an IC mounting area of a substrate,  
4 the IC mounting area comprising a plurality of pads;

5 placing an IC on the IC mounting area, such that terminals of the IC are  
6 aligned with corresponding pads and substantially enveloped in the underfill  
7 material;  
8 applying suitable pressure to cause the terminals to physically contact the  
9 pads; and  
10 applying suitable heat to harden the underfill material.

1 28. The electronic assembly recited in claim 27 and fabricated such that the  
2 operations of applying suitable pressure and suitable heat are performed  
3 substantially concurrently by apparatus from the group comprising a  
4 thermocompression bonder, an ultrasonic bonder, and a component placement tool.

1 29. The electronic assembly recited in claim 27, wherein the underfill material  
2 comprises a filler material selected from the group comprising silica, silicon oxide,  
3 silicon dioxide, silicon nitride, aluminum oxide, and aluminum nitride.

1 30. An electronic system comprising:  
2 a bus coupling components in the electronic system;  
3 a display coupled to the bus;  
4 external memory coupled to the bus; and  
5 a processor coupled to the bus and having an electronic assembly including  
6 at least one integrated circuit (IC) package fabricated by:  
7 depositing a no-flow underfill material in an integrated circuit (IC)  
8 mounting area of a substrate, the IC mounting area comprising a plurality of  
9 pads;  
10 placing an IC on the IC mounting area, such that terminals of the IC  
11 are aligned with corresponding pads and substantially enveloped in the  
12 underfill material;  
13 applying suitable pressure to cause the terminals to physically  
14 contact the pads; and

15           applying suitable heat to harden the underfill material.

1    31.    The electronic system recited in claim 30 and fabricated such that the  
2    operations of applying suitable pressure and suitable heat are performed  
3    substantially concurrently by apparatus from the group comprising a  
4    thermoccompression bonder, an ultrasonic bonder, and a component placement tool.

1    32.    The electronic system recited in claim 30, wherein the underfill material  
2    comprises a filler material selected from the group comprising silica, silicon oxide,  
3    silicon dioxide, silicon nitride, aluminum oxide, and aluminum nitride.

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